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Ethnobotanical and phytochemical study of medicinal plants used to treat prostatitis in the south-banga area, ILEBO territory, Democratic Republic of Congo

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ABSTRACT

This study focuses on medicinal plants traditionally used to treat prostatitis in the South Banga sector, Ilebo territory, in the Democratic Republic of the Congo. Its objectives were to catalogue the plant species used in the traditional management of prostate conditions, to determine their ethnobotanical significance, to specify the parts used as well as the methods of preparation and administration of the remedies, and to assess their phytochemical profiles.

An ethnobotanical survey based on semi-structured interviews, direct observation and reasoned non-probabilistic sampling was conducted amongst 32 key informants from the six communities in the Sud-Banga sector. The data collected focused in particular on plant species, the parts used, methods of preparation, solvents and routes of administration. Nine medicinal species were identified: *Rauvolfia vomitoria*, *Gardenia ternifolia*, *Citrus limon*, *Garcinia kola*, *Ananas comosus*, *Morinda morindoides*, *Senna occidentalis*, *Senna siamea* and *Psidium guajava*. The *Rubiaceae* and *Fabaceae* families are among the best represented in the thesis's floristic data.

The highest relative frequency of mention was observed for *Gardenia ternifolia*, *Garcinia kola* and *Ananas comosus* (15.63 per cent each), followed by *Citrus limon* (12.50 per cent). The informant consensus index was 0.758, indicating a relatively high level of consensus regarding the species used. Roots are the most frequently used part of the plant, whilst decoction and oral administration are the predominant method of preparation and route of administration, respectively.

Phytochemical screening revealed several groups of secondary metabolites, notably alkaloids, flavonoids, tannins, saponins, terpenoids, quinones and quinines, as well as other groups listed in the detailed table in the thesis. Alkaloids were detected most frequently in the summary of results. These observations demonstrate that the populations of the South Banga region possess a diverse body of ethnobotanical knowledge. However, the presence of secondary metabolites alone is not sufficient to establish the clinical efficacy of the plants against prostatitis. Further pharmacological, toxicological and clinical studies are therefore required.

Keywords: ethnobotany, phytotherapy, prostatitis, medicinal plants, phytochemicals, secondary metabolites, South Banga, Ilebo, DRC.

1. Introduction

Traditional medicine is an important component of the healthcare systems of many African populations. In several

rural regions, medicinal plants represent an accessible therapeutic resource and are used to treat various conditions.

Knowledge of medicinal plants is generally passed down from generation to generation and is based primarily on the experience accumulated by traditional healers, herbalists and certain elderly members of the communities. This knowledge constitutes an important cultural heritage that deserves to be documented and studied scientifically.

Prostatitis is a condition affecting the prostate that may be associated with pelvic pain, urinary problems and genitourinary symptoms. In communities where access to modern healthcare facilities remains limited, some people turn to traditional herbal treatments.

In the South Banga region, several plants are traditionally used to treat prostate-related conditions. However, the scientific evidence supporting these practices remains limited. It is therefore important to identify the species used, to specify which parts of the plants are used, the methods of preparation and the routes of administration, and then to examine their phytochemical composition.

In this context, ethnobotany provides an approach for documenting the relationships between communities and plant resources. It also enables the identification of species of particular cultural or therapeutic significance.

This study therefore aims to contribute to the documentation of traditional knowledge in the South Banga region and to provide scientific evidence that may guide future pharmacological research into plants used to treat prostatitis.

Objectives

The general objective is to conduct an ethnobotanical and phytochemical study of plants traditionally used in the treatment of prostatitis in the South Banga region.

Specific objectives:

To compile a list of medicinal plants used to treat prostatitis;

To determine the frequency of mention and certain ethnobotanical indices;

To specify the plant parts used, methods of preparation and routes of administration;

To describe certain floristic and ecological characteristics of the species identified;

To carry out a phytochemical screening of the species studied.

2.1. Materials and methods

The biological material used in our study consists of nine medicinal plant species: *Rauvolfia vomitoria* Afzel; *Garcinia kola* Heckel, *Gardenia ternifolia*, Schum. and Thonn.; *Morinda morindoides* Buker; *Senna occidentalis* L. (Link); *Sena ciaméa* (Lam.) H.S.; *Ananas comosus* (L.) Mer.; *Psidium guajava* L.; *Citrus limon* L.

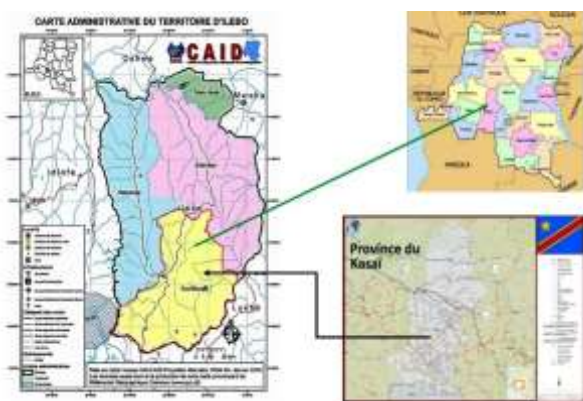


Figure 1: Administrative map of the Ilebo region.

- **Ethnobotanical survey**

This study was carried out in the six (6) communities of the South-Banga sector; this sector, situated between the ELK Basongo sector, faces numerous problems, including the degradation of its ecosystems of all types

2.2. Sampling technique

Sampling was non-probabilistic, of the reasoned or purposive type, which is particularly suited to ethnobotanical studies. This method enabled us to select key individuals or informants, i.e. those likely to possess relevant knowledge about medicinal plants used to treat prostatitis in this sector.

The six communities in the South-Banga sector were taken into account in order to obtain a representation of the ethnobotanical knowledge available in the study area. In each community, individuals likely to provide relevant information were identified with the help of community members and, above all, using our questionnaire.

Particular attention was paid to traditional healers and herbalists, who are regarded as key custodians of traditional knowledge relating to medicinal plants.

2.3. Population and sampling

The population considered in this thesis consists of individuals likely to possess relevant knowledge of medicinal plants. The total population for the six communities is 57 people, whilst the sample selected for the ethnobotanical analyses comprises 32 key informants.

The sampling method is non-probabilistic, of the reasoned or purposive type. This method is particularly well-suited to ethnobotanical studies as it allows for the selection of individuals with relevant knowledge of the field under study. Particular attention was paid to traditional healers and herbalists.

The detailed data in the thesis also show that the informants were selected on the basis of their experience in using medicinal plants and their ability to describe therapeutic preparations.

2.3. Data collection techniques

We combined two techniques in our data collection: literature review and semi-structured interviews using a questionnaire.

2.4. Sample size

Sampling was non-probabilistic, of the reasoned or purposive type, particularly suited to ethnobotanical studies. In total, 57 informants were identified across all six communities in the sector in question, namely:

- 19 traditional practitioners;
- 14 herbalists;
- 16 patients;
- 8 elderly people.

Of these informants, 32 were selected. They were chosen on the basis of their age and their in-depth knowledge of medicinal plants in general and of the species used in the treatment of prostatitis in particular. This group also included traditional healers and/or herbalists, as well as patients who had recovered following traditional treatment.

For traditional healers and/or herbalists, the criteria included having practised the profession for at least ten years and having lived in one of the communities for more than ten years. Informants were also required to have given their free and informed consent to complete the semi-structured

questionnaire and take part in the interviews organised for this purpose.

The 32 informants were divided into four groups: traditional healers, herbalists, elderly people and recovered patients. Based on these criteria, eight (8) informants were selected from each category. Thus, the 32 informants constitute our sample.

After consulting traditional healers, herbalists and elderly men with knowledge of the plants used to treat prostatitis, we were taken to the various ecosystems where these species grow in order to collect data on each species selected for this study.

2.4. Botanical identification

The plant samples collected were sent to the herbarium specified in the thesis for botanical identification. The initial identification was carried out with the assistance of a specialist.

2.5. Ethnobotanical analysis

Several ethnobotanical parameters were considered:

Relative frequency of mention:

The relative frequency of mention was calculated as follows:

$$RCF = FC / N$$

Where FC represents the number of informants who mentioned a species and N the total number of informants.

Based on 32 informants, *Gardenia ternifolia*, *Garcinia kola* and *Ananas comosus* each have a FRC of 15.63 per cent, whilst Citrus limon has a FRC of 12.50 per cent.

Informant consensus index:

The informant consensus index obtained in this thesis is:

$$ICF = 0.758$$

This value is interpreted as indicating a high level of consensus amongst informants regarding the plants used to treat prostatitis.

Usage value:

The usage value was also taken into account in order to assess the relative importance of the species based on the citations reported by the informants.

It should be noted, however, that the formula shown in one section of the thesis is inconsistent with the figure of 32 informants. In the scientific article, this data will therefore need to be recalculated before final submission to a journal.

2.6. Floristic and ecological analysis

The species were characterised according to various parameters: biological types, leaf types, diaspore types, habitats and phytogeographical distribution.

Biological types were determined with reference to the Raunkiaer system adapted to tropical conditions. The resulting spectrum shows a predominance of phanerophytes, accounting for 88.9 per cent, compared with 11.1 per cent for cryptophytes.

Mesophytes account for 77.8 per cent of the species and microphyte species for 22.2 per cent. As regards diaspores, sarcochores dominate, accounting for 66.7 per cent.

The phytogeographical distribution shows a predominance of pantropical species (55.6 per cent), followed by Guineo-Congolese species (33.3 per cent) and Afro-tropical species (11.1 per cent).

2.7. Phytochemical analysis

The selected plant species underwent qualitative phytochemical screening. The analyses sought to identify various groups of secondary metabolites.

In particular, the thesis reports on the search for alkaloids, flavonoids, tannins, saponins, terpenoids, quinones and quinines. The detailed table also lists other chemical groups.

The results were expressed qualitatively as the presence (+) or absence (-) of the chemical groups sought.

3. Results

3.1. Diversity of medicinal plants

The study identified nine medicinal species traditionally used to treat prostatitis:

No.	Species	Family
1	<i>Rauvolfia vomitoria</i> Afzel.	<i>Apocynaceae</i> ²
2	<i>Ananas comosus</i> (L.) Merr.	<i>Bromeliaceae</i>
3	<i>Garcinia kola</i> Heckel	<i>Clusiaceae</i>
4	<i>Senna occidentalis</i> (L.) Link	<i>Fabaceae</i>
5	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	<i>Fabaceae</i>
6	<i>Psidium guajava</i> L.	<i>Myrtaceae</i>
7	<i>Gardenia ternifolia</i> Schum. & Thonn.	<i>Rubiaceae</i>
8	<i>Morinda morindoides</i>	<i>Rubiaceae</i>
9	<i>Citrus limon</i> (L.) Burm.f.	<i>Rutaceae</i>

The thesis abstract lists eight families, whilst the detailed table lists seven. This discrepancy will need to be resolved in the final version prior to publication.

3.2. Relative citation frequency

The species with the highest relative citation frequencies are *Gardenia ternifolia*, *Garcinia kola* and *Ananas comosus*, each with 15.63 per cent. *Citrus limon* follows with 12.50 per cent. The other five species each have 9.38 per cent.

Relative citation frequency (RCF/RFC)

Species	FC	RCF	RCF (%)
<i>Rauvolfia vomitoria</i>	3	0.094	9.38
<i>Gardenia ternifolia</i>	5	0.156	15.63
<i>Citrus limon</i>	4	0.125	12.50
<i>Garcinia kola</i>	5	0.156	15.63
<i>Ananas comosus</i>	5	0.156	15.63
<i>Morinda morindoides</i>	3	0.094	9.38
<i>Senna occidentalis</i>	3	0.094	9.38
<i>Senna siamea</i>	3	0.094	9.38
<i>Psidium guajava</i>	3	0.094	9.38
Total	34		

3.3. Plant parts used

Roots are the most commonly used part, accounting for 54.5 per cent of uses, followed by leaves and fruits/seeds, each at 18.2 per cent, and then bark at 9.1 per cent.

This predominance of root use indicates that local therapeutic knowledge places particular importance on underground parts.

3.4. Methods of preparation

Decoction is the only method of preparation reported in the thesis data, accounting for 100 per cent.

This practice involves boiling the plant parts to extract the substances soluble in the preparation liquid.

3.5. Route of administration

The oral route is the sole route of administration, accounting for 100 per cent.

3.6. Solvents used

The three most commonly used solvents are: water: 55.6 per cent; palm wine: 33.3 per cent; ethanol: 11.1 per cent.

Water is therefore the main solvent used in traditional preparations.

3.7. Biological spectrum

Pheneroophytes account for 88.9 per cent of the recorded species, compared with 11.1 per cent for cryptophytes. Among the pheneroophytes, micropheneroophytes are the most common, accounting for 44.4 per cent.

3.8. Foliar spectrum

Mesophiles clearly dominate the leaf spectrum, accounting for 77.8 per cent, compared with 22.2 per cent for microphylls.

3.9. Diasporic spectrum

Sarcochores constitute the dominant group, accounting for 66.7 per cent, followed by barochores at 22.2 per cent and ballochores at 11.1 per cent.

3.10. Habitat spectrum

Forest and ruderal species each account for 33.3 per cent of the species, savannah species for 22.2 per cent and cultivated species for 11.1 per cent.

3.11. Phytogeographical distribution

Pantropical species are in the majority, accounting for 55.6 per cent. Guineo-Congolese species account for 33.3 per cent, whilst Afro-tropical species account for 11.1 per cent.

3.12. Informants' consensus

The ICF obtained is 0.758. This value reflects a high degree of convergence in the informants' knowledge regarding a relatively limited number of medicinal species.

3.13. Phytochemical results

Phytochemical screening revealed the presence of several groups of secondary metabolites. The thesis specifically reports alkaloids, flavonoids, tannins, saponins, terpenoids, quinones and quinines.

In the detailed phytochemical table, polyphenols and steroids are reported in 100 per cent of the samples, followed by tannins, alkaloids and terpenoids at 88.9 per cent. Flavonoids and coumarins were found in 77.8 per cent of samples, anthocyanins and certain categories of quinones in 66.7 per cent, saponins in 55.6 per cent, whilst leucocyanidins were reported in 33.3 per cent.

According to the thesis, *Morinda morindoides* has the richest phytochemical profile at 91.7 per cent, followed by *Citrus limon* at 83.3 per cent. *Rauvolfia vomitoria*, *Ananas comosus*, *Garcinia kola*, *Senna occidentalis*, *Senna siamea* and *Psidium guajava* each contain 75 per cent, whilst *Gardenia ternifolia* contains 58.3 per cent.

4. Discussion

Our research in 2026 on medicinal plants used in the treatment of prostatitis in the Bashi Mabombo community, Ilebo territory, identified 9 plant species belonging to 7 botanical families. Among these families, the Fabaceae and Rubiaceae are the best represented, followed by the Apocynaceae. This predominance could be explained by the diversity of species belonging to these families in the local flora, as well as by their traditional use in folk medicine. These results show similarities with those of Nku (2026), who, in a study carried out in the Kitoy territory, recorded 8 species across 6 families, with a similarly strong representation of the Fabaceae and Rubiaceae. This concordance between the two studies suggests that certain botanical families play an important role in the traditional medicinal practices of these different regions.

Furthermore, the results obtained are consistent with those reported by Lassa *et al.* (2019).

4.1. Diversity of medicinal plants

The presence of nine medicinal species in the study area demonstrates that the communities of the South Banga sector possess a diverse body of traditional knowledge regarding the use of plant resources.

The predominance of dicotyledonous species (*Magnoliopsida*) in the inventory indicates that use is

primarily focused on woody plants and certain cultivated or wild plants.

The presence of two species of Rubiaceae and two species of Fabaceae also highlights the importance of certain families in the local pharmacopoeia.

However, the diversity observed should not be interpreted as evidence of therapeutic efficacy. It is, above all, an indicator of the richness of local knowledge.

4.2. Importance of *Gardenia ternifolia*, *Garcinia kola* and *Ananas comosus*

The three species with the highest relative frequency of mention are *Gardenia ternifolia*, *Garcinia kola* and *Ananas comosus*.

A high frequency of mention may reflect several factors: greater availability of the species, extensive transmission of knowledge, high levels of confidence among informants, or more frequent use of the plant.

In the case of *Garcinia kola*, its significance in African pharmacopoeias has already attracted scientific interest due to the diversity of its secondary metabolites and the various biological activities reported in the literature.

These observations justify the need for further pharmacological research focusing specifically on the species most frequently cited in the South Banga region.

4.3. Importance of the root

The root is the most commonly used part of the plant. This can be explained by the traditional belief that the plant's medicinal properties are concentrated in its underground parts.

However, the extensive use of roots also raises an ecological concern. Excessive harvesting of roots can lead to the destruction of individual plants and compromise the natural regeneration of the species.

From a conservation perspective, it would therefore be desirable to investigate, where possible, the use of renewable parts such as leaves, whilst ensuring that their pharmacological efficacy is comparable.

4.4. Predominance of the decoction

Decoctions account for 100 per cent of the reported preparation methods. This practice can facilitate the extraction

of certain water-soluble substances and is a simple and accessible method for local communities.

However, prolonged heating may also alter or degrade certain heat-labile molecules. Traditional preparation cannot therefore be directly equated with standardised pharmacological extraction.

Experimental research should compare different extraction conditions to determine their influence on chemical composition and biological activity.

4.5. Oral route

The oral route is the only one reported in the study data. This finding is consistent with the preparation of decoctions intended for consumption.

This practice nevertheless requires particular attention to toxicity, dosage, duration of treatment and any potential interactions with other medicines.

Traditional knowledge of dosage is an important aspect to be documented in future research, as a medicinal plant may contain molecules that are beneficial at certain concentrations but potentially toxic at higher doses.

4.6. Ethnobotanical consensus

The consensus index of 0.758 reflects a remarkable convergence of ethnobotanical knowledge amongst the informants.

Conclusion

The aim of this study was to contribute to our understanding of the medicinal plants traditionally used in the management of prostatitis in the South Banga region, with a focus on ethnobotanical knowledge and certain phytochemical constituents of the species identified.

The ethnobotanical investigations identified nine medicinal plant species belonging to several botanical families and used by local communities in the treatment of conditions associated with prostatitis. The results show that these plant resources play an important role in local traditional therapeutic practices. Different parts of the plants, notably the roots, leaves, fruits and other organs, are used in various ways of preparation and administration.

Analysis of the ethnobotanical data also revealed differences in the frequency with which species were cited. Certain plants, notably *Gardenia ternifolia*, *Garcinia kola* and *Ananas*

comosus, were mentioned relatively frequently by informants, reflecting their importance in local therapeutic knowledge. These results demonstrate the existence of diverse traditional knowledge regarding the use of plant resources to treat prostate conditions.

From a phytochemical perspective, the screening carried out revealed the presence of several groups of secondary metabolites, notably alkaloids, flavonoids, tannins, saponins, terpenoids and quinones. The high frequency of certain of these compounds, particularly alkaloids, suggests a potential pharmacological interest in the species studied. However, the presence of secondary metabolites alone is not sufficient to establish therapeutic efficacy against prostatitis. Further investigations are therefore required to identify the molecules responsible for the observed biological activities and to clarify their mechanisms of action.

This study thus contributes to the documentation and promotion of the ethnobotanical knowledge held by the communities of the South Banga region. It also provides a basis for further research into the pharmacological, toxicological and clinical evaluation of the identified plants. The sustainable conservation of these plant resources and the transmission of traditional knowledge are also important for preserving this local therapeutic heritage.

Ultimately, the results obtained show that the medicinal plants used in the South Banga region constitute an important source of ethnobotanical knowledge and potentially valuable bioactive substances. Their scientific validation, however, will need to be underpinned by in-depth experimental studies to confirm their efficacy, safety and conditions of use prior to any potential therapeutic application.